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A PROBLEM ANALYSIS of the HARDWOOD DIMENSION INDUSTRY

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By
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INTRODUCTION

Hardwood dimension stock is here defined as cut-to-size hardwood lumber components for incorporation in other products. It may be: (1) rough boards or squares sawed and ripped to specific sizes, (2) semi-fabricated parts more refined than rough dimension but not ready for assembly in final products, or (3) completely fabricated parts ready for assembly in final products.

It has been estimated that more than 80 percent of the hardwood lumber consumed is reduced to pieces under 4 inches in width and 2 feet in length (50).[1/] In other words most hardwood lumber is reduced to small dimension stock prior to use in the final product.

Manufacturers who use hardwood parts have the choice of purchasing precut hardwood dimension, or purchasing lumber to make their own dimension. By purchasing precut dimension they may realize savings in raw material transportation and processing costs, and may be able to use labor and capital more efficiently.

The practice of purchasing premanufactured parts or sub-assemblies stems from specialization and division of labor characteristic of industrialized economies. It is a common practice in non-wood using industries such

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[1/] Underlined numbers in parentheses refer to corresponding numbers in the bibliography, page 64.

as the automobile, electronic, and aero-space industries, but less prevalent in wood using industries such as furniture.

The furniture industry constitutes the largest market for hardwood dimension stock, and the fact that the dimension industry exists indicates that some furniture manufacturers feel that there are advantages in using purchased dimension stock. However, since furniture manufacturers still produce about 80 percent of their own dimension requirements,[2/] either there are disadvantages to using purchased dimension which generally override the advantages, or furniture producers are not generally aware of the advantages.

This analysis has been undertaken to describe and analyze the hardwood dimension industry and to pinpoint problems requiring additional study. It is based on the premise that a better understanding of the industry and its market structure, conduct, and performance will result in better allocation of labor, capital, and raw material resources with resultant benefits to the industry and the economy.

2/ Derived from data in 1958, Census of Manufacturers (66) and Gill (38).

THE INDUSTRY

The hardwood dimension industry as here defined consists of firms that manufacture hardwood dimension stock for sale to other firms. The U.S. Department of Commerce classifies the industry in Standard Industrial Code 24262, Hardwood Dimension and Glued Laminates. This classification, which will be used throughout the problem analysis, includes (73):

24262.21 Kiln- or air-dried rough or surfaced furniture dimension including glued laminates.

24262.51 Semi-fabricated furniture dimension.

24262.81 Completely fabricated furniture dimension, including furniture parts, except frames.

24262.84 Other industrial dimension stock (for handles, golf clubs, agricultural implements, railroads cars, vehicle parts, ladder parts, skis, gunstocks, brushes, textile machinery stock, and semi-fabricated industrial parts).

24262.89 Completely fabricated hardwood industrial parts including vehicle stock.

24262.00 Hardwood dimension stock--not specified by kind.

NUMBER AND SIZE OF FIRMS

There were 405 establishments primarily engaged in manufacturing hardwood dimension in 1963 (73). Most of these firms are small with an average of 32 employees per firm (73). The number and size of firms in the dimension industry has remained relatively stable over the last 10 years. This may be an indication that over capacity has existed in the industry since both dimension and furniture sales have been steadily increasing over this same period.

However, there are indications that the dimension industry is presently operating at or near full capacity. Many dimension producers have stated that there is room in the industry for new firms because it is becoming difficult to fill the increasing quantity of orders.[3/] Since none of the existing firms in the industry seem to have an advantage of size, product differentiation or superior production techniques, there are few barriers to entry of new firms into the industry. The lack of entry barriers in turn limits the possibilities of existing firms achieving large scale production economies which would enable dimension stock production to be more competitive with the rough-end mill of furniture firms. This problem is further aggravated by the fact that sawmills, millwork factories, and other wood product plants can and do manufacture dimension stock as a part of their normal operations and if demand is high may enter the market.

3/ From discussions with dimension manufacturers, October-November 1965. Notes on file at Forest Products Marketing Laboratory, Princeton, W. Va.

LOCATION

The dimension industry is widely dispersed over the eastern half of the United States. Tennessee ranked first in 1963 value of shipments followed by North Carolina, Mississippi, and Arkansas. New York, Pennsylvania, Michigan, and Kentucky also produced substantial amounts. Between 1958 and 1963, 13 states grew faster than the average for all United States value of dimension shipments (table 1). Three states--New York, California, and Georgia--showed a decline in shipments. The reasons for these declines are unclear but may be due to depletion of raw materials, a change in species used by consumers, a declining local market, or a reduction in number of operating firms. The greatest absolute increases were in Tennessee, North Carolina, and Pennsylvania; Pennsylvania showed by far the greatest percentage increase.

The industry appears ideally located near both major markets and raw material supplies. All of the states which have a relatively high concentration of dimension production are also important hardwood lumber producers and are reasonably close to major furniture producing centers (figure 1).

Nearness to furniture production centers is apparently not as important a location factor as proximity to lumber supplies. Haas (40) found that furniture manufacturers were willing to go an average of 340 miles for fully machined stock and some as far as 2,368 miles. The ideal situation for both producer and user of dimension stock in terms of most efficient operation is for a dimension user to locate his assembly and finishing plant close to a metropolitan area and purchase fully machined

Table 1.--Value of shipments of hardwood dimension by state, 1958 and 1963

State	Value of shipments			
	1958	1963	Increase (Decrease) 1958-1963	
	Thousand dollars	Thousand dollars	Thousand dollars	Percent
All U. S.	102,895	169,806	66,911	65.0
Tennessee	10,440	20,424	9,984	95.6
North Carolina	11,569	19,019	7,450	64.4
Mississippi	8,108	15,262	7,154	88.2
Arkansas	6,470	12,274	5,804	89.7
Kentucky	5,362	8,368	3,006	56.1
Pennsylvania	1,992	8,248	6,256	314.1
New York	8,912	7,972	(940)	(10.5)
Michigan	5,770	7,287	1,517	26.3
Wisconsin	1,728	5,781	4,053	234.5
Missouri	3,365	5,723	2,358	70.1
Maine	2,013	5,341	3,328	165.3
Louisiana	4,353	5,309	956	22.0
Indiana	2,354	5,141	2,787	118.4

(continued)

Table 1.--Value of shipments of hardwood dimension by state, 1958 and 1963 contd.

State	Value of shipments			
	1958	1963	Increase (Decrease) 1958-1963	
	Thousand dollars	Thousand dollars	Thousand dollars	Percent
Ohio	1,539	4,702	3,163	205.5
Virginia	1,827	4,007	2,180	119.3
Alabama	1,963	3,281	1,318	67.1
South Carolina	1,625	3,250	1,625	100.0
Washington	2,690	3,047	357	13.3
Illinois	1,990	2,962	972	48.8
West Virginia	1,172	2,808	1,636	139.6
California	3,596	2,692	(904)	(25.1)
Georgia	2,282	2,028	(254)	(11.1)
Florida	Not Reported	1,663	--	--
New Hampshire	1,066	1,139	73	6.8
Massachusetts	Not Reported	1,105	--	--
New Jersey	1,679	1,040	(639)	(38.1)

Source: U.S. Department of Commerce, Census of manufactures, 1963. Final report MC63(2)-24A, logging camps, sawmills, and planing mills. 1966.

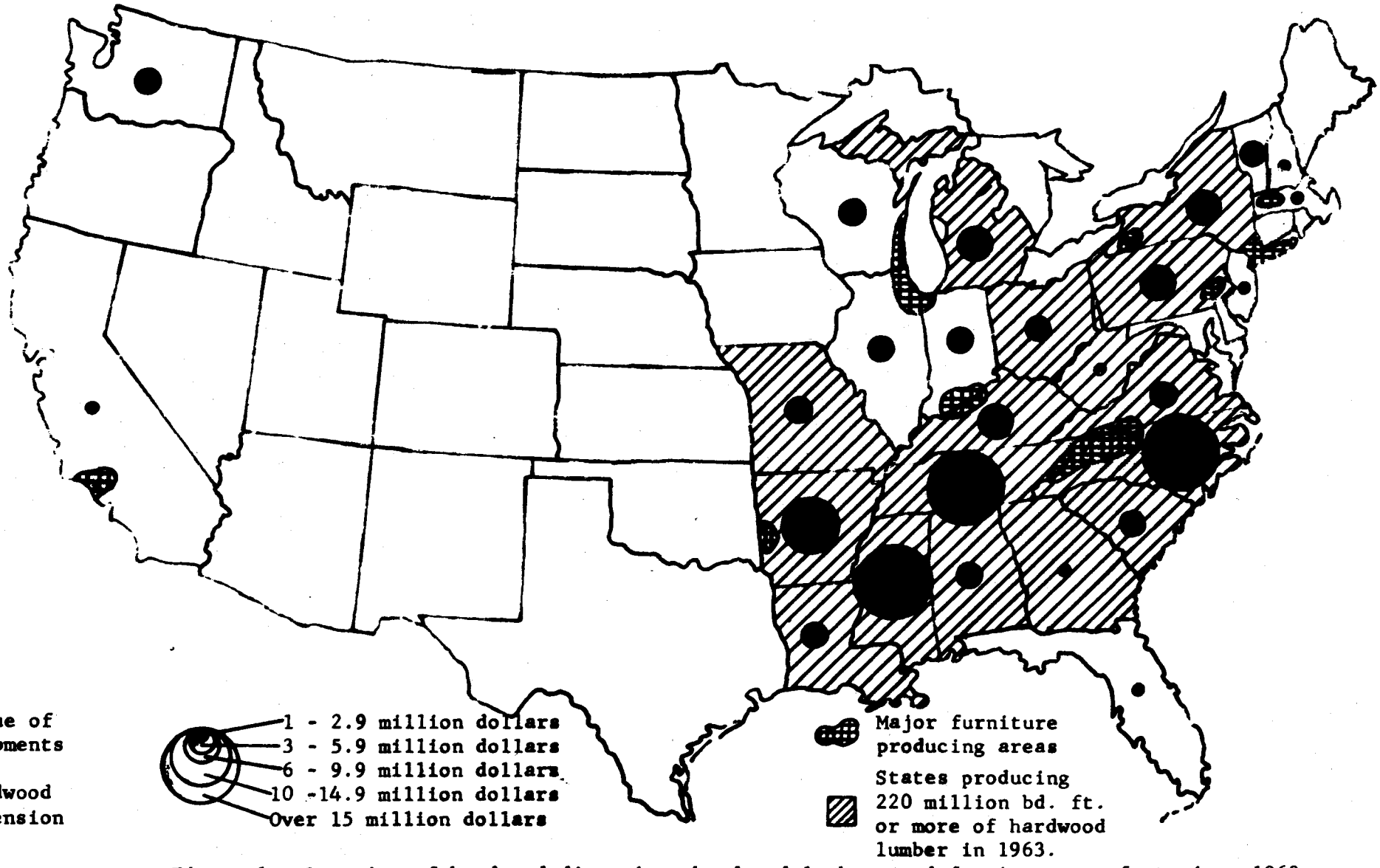

Figure 1.--Location of hardwood dimension, hardwood lumber, and furniture manufacturing, 1963

Source: U.S. Dept. Com. Census of manufactures, 1963. Final report MC63(2)-24A, 1966 and Area Redevelopment Administration, A forest industry processing and marketing complex for Eastern Kentucky. 1963.

dimension from a dimension producer located close to the lumber supply point in a lower rent and lower wage area. From this situation a dimension user derives:

1. A savings in transportation costs by paying only for the shipment of usable material not the waste or water found in rough, green lumber;

2. More productive use of high cost labor by using labor for higher value items;

3. More productive use of space by reducing storage area and using factory space for producing items of higher value than dimension stock.

Such ideal conditions do exist in the metropolitan furniture producing areas of Los Angeles, Chicago, and New York City. However, the concentration of the dimension industry in the Tennessee-North Carolina area may not be as advantageous as it appears in relation to the large furniture manufacturing area of North Carolina and Virginia. The wage rate differential for furniture and dimension manufacturers tends to be low in this area and the furniture manufacturers are close to an abundant supply of hardwood lumber. These factors reduce the cost advantage of dimension stock and may explain in part an apparent reluctance of southern furniture manufacturers to use purchased dimension.

LABOR

The hardwood dimension industry is labor intensive, therefore, the cost and availability of labor of primary concern (table 2). Wages in the hardwood dimension industry increased about 38 percent between 1954 and 1963, but productivity has increased 42 percent (figure 2). This indicates that rising labor costs alone should not affect the competitive position of the industry.

Dimension industry wages have been low compared to the average for all manufacturing industries:

Year	Average wage hardwood dimension industry	Average wage all manufacturing industries
1954	1.19	1.83
1958	1.42	2.18
1963	1.64	2.52

Source: U.S. Dept. Comm. Census of Manufactures and Annual Survey of Manufactures for selected years.

Generally dimension industry wages are lower than furniture industry wages (table 3) but where dimension firms are located close to furniture firms, which is the case in some areas of the South, the two industries are competing in the same labor market. This applies pressure from two sides: (1) the dimension producers must bid labor prices up to keep their trained personnel or (2) they must accept lower quality workmen at a lower price. Both will reduce

Table 2.--Man hours per $1,000 value added by manufacture, selected industries, 1958

All manufacturing industries	162
Lumber and wood products	327
Hardwood Dimension	373
Furniture and fixtures	
Wood household furniture, not upholstered	308
Textile mill products	324
Pulp, paper, and products	161
Primary metal products	145
Food and kindred products	133
Chemicals	78

Source: Derived from U.S. Department of Commerce, 1958 Census of Manufacturers.

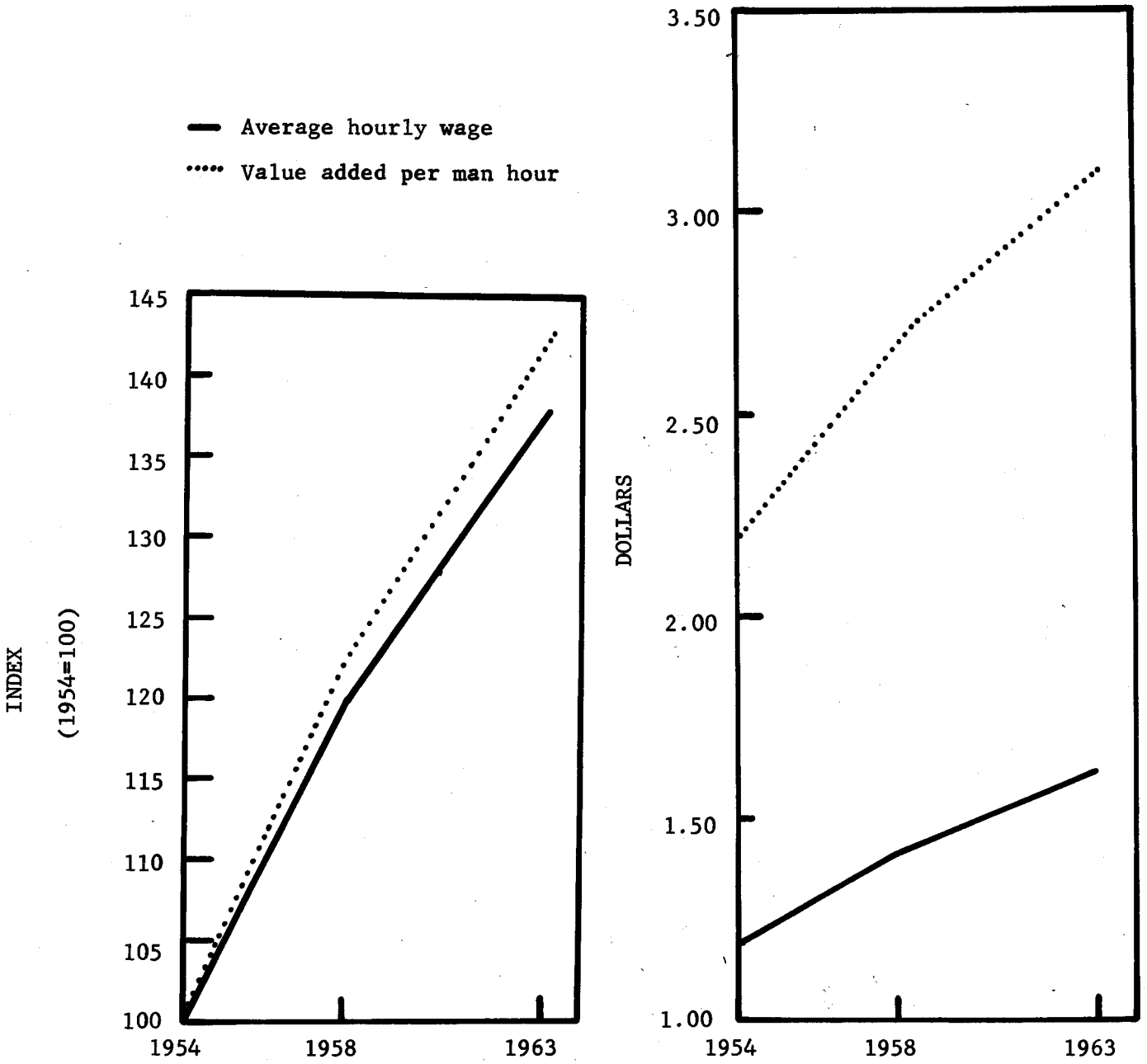

Figure 2.--Wages and productivity, hardwood dimension industry, 1954, 1958, and 1963

Source: U.S. Dept. Com. Census of manufactures, 1963. Final report MC63(2)-24A. Logging camps, sawmills and planing mills. 1966.

Table 3.--Average hourly wage,[1/] selected industries by regions, 1963

Region	Wood household furniture not upholstered (SIC2511)	Wood household furniture upholstered (SIC2512)	Hardwood dimension and flooring (SIC2426)[2/]	Hardwood dimension (SIC2426)
New England	1.88	2.01	1.61	---
Mid Atlantic	1.99	2.35	1.86	---
East North Central	1.93	2.19	1.87	---
West North Central	1.88	2.12	1.61	---
South Atlantic	1.60	1.74	1.45	---
East South Central	1.61	1.56	1.48	---
West South Central	1.51	1.68	1.45	---
Mountain	2.07	1.92	2.19	---
Pacific	2.46	2.73		---
All United States	1.78	1.99	1.54	1.64

1/ Calculated by dividing production wages by production man hours.

2/ Note: This includes hardwood flooring. Dimension wages may be slightly higher than the average for SIC 2426.

Source: U.S. Dept. Com. Census of Manufactures, 1963. Final report MC63(2)-24A, logging camps, sawmills, and planing mills; and Final Report MC63(2)-25A, household furniture. 1966.

some of the advantages that hardwood dimension has over rough-mill production.

Quality of labor is important to the dimension producer because it affects quality of output which is of primary concern to dimension users. If a pool of quality labor is not available to the dimension industry or cannot readily be obtained through training, the industry may be forced into a poor competitive position.

The economic expansion over the past 5 years has lowered the national unemployment rate and has reduced the skilled labor pool for many industries to the lowest point since the Korean War (35). Apparently, this shortage is being felt in the woodworking industry also.[4/] This may be only a short-run problem, but if it affects the total available supply of dimension or its quality long enough to force potential users to buy other materials it will affect the long-run market position of the industry.

A possible solution is to train additional labor. However, many producers may be too small to absorb the necessary costs of such a program. In addition, if the supply of trainable labor is low this solution becomes untenable. An alternative would be to substitute capital for labor. This

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[4/] From discussions with dimension manufacturers during November-December 1965. Notes on file at the Forest Products Marketing Laboratory. Princeton, West Virginia.

can and probably should be done but limiting factors may be the cost and availability of capital and a lack of technological skill or knowledge at the managerial level.

DIMENSION STOCK PRODUCTION

Raw Materials

Dimension stock may be produced from hardwood lumber, bolts, or mill residue, but over 95 percent is made from hardwood lumber (38). The dimension industry used over 551 million board feet of hardwood lumber in 1963--about 8 percent of all hardwood lumber produced that year (73).

Species requirements vary with and are almost entirely dependent upon the end use of the dimension stock. In the furniture industry the interaction of consumer desires, lumber availability, price, and physical characteristics of lumber will determine the lumber species purchased.5/ Presumably these same criteria would determine the species purchased by the dimension manufacturers.

5/ Sarles, Raymond L. A determination of selective consumer specifications for Appalachian hardwood lumber by major lumber users. 1965. (In preparation for publication, Northeastern Forest Experiment Station, Forest Products Marketing Laboratory, Princeton, West Virginia.)

Other industries using dimension stock probably rate the mechanical properties most important. Tool handles have traditionally been made of ash and hickory because of the toughness and good finishing characteristics of those species; ash has been the favorite species for baseball bats because of its toughness and resiliency; a component for the Ranger II Moon Rocket was made of maple because of its low electrostatic conductivity (14); and birch is used for turnings and specialty products because of its good machining qualities. In products such as painted juvenile furniture and core stock where appearance and strength are not as important, the most important species considerations probably are availability, price, finishing characteristics, and nail or adhesive holding ability.

The availability of a species in a given area may limit a dimension producer's market. For example, if a dimension producer is located in an area where birch is scarce, he may not be able to effectively compete in markets where birch is required. This is probably not a problem for the industry as a whole but may limit the market expansion or diversification of individual firms.

Production Methods

The equipment required to manufacture hardwood dimension depends on the degree of product refinement desired, but the flow of production is similar for all products. An input of lumber, usually kiln-dried at the dimension mill, is crosscut, ripped, and surfaced to desired dimensions.

The resulting pieces then move to various machining, gluing and surfacing operations depending on the final product required.

A firm could conceivably begin dimension stock production with crosscut saws, ripsaws, and a surface planer producing small boards cut to width, length, and thickness. For further product refinement dry-kilns, tenoners, molders, shapers, routers, and borers are essential. Most manufacturers also include equipment for edge gluing and laminating to make core stock, chair seats, meat and bread cutting boards, and other products requiring wider pieces. Sanding equipment and lathes provide even more refinement in many plants. Although additional equipment means higher capital investment, it is generally agreed that the greater revenue generated by a higher quality more fully machined product more than offsets the increased investment and production costs (40, 59).

Two of the most critical operations in the production of dimension stock are the crosscut and rip. These two operations essentially determine the yield of usable product from a given input of lumber. Some of the more progressive manufacturers keep yield data that is often used as a base for pricing their final products. Although some manufacturers have been doing this for 20 years or more, it is only recently that the use of charts to correlate full potential yield of given dimension stock sizes to lumber grades and sizes is gaining recognition in the industry as a production control tool.

Almost all dimension firms cut only for orders and maintain no inventory of precut parts. This practice is necessary because of the wide diversity in user requirements. Most dimension manufacturers try to combine orders in one production run to obtain fullest possible use of the lumber input, but this is not always possible. When it is not, cost is increased and efficiency reduced. More standardization of basic user specifications would alleviate this problem somewhat.

MARKETING PRACTICES

Four major tools that a firm or industry can use to sell its products are: (1) price, (2) promotion, (3) product differentiation, and (4) channels of distribution.

Price

Price to the dimension user is generally stated in one of two ways: per board foot or per piece. The more fully machined the dimension product, the more likely it is to be priced per piece.

An important factor in establishing the price for hardwood dimension is the cost of the lumber used to produce it. Figure 3 shows the trend in the wholesale price index of hardwood lumber on a monthly basis since 1958. Beginning in 1963 there has been a steady and rapid increase in prices. Labor cost is another major factor in establishing dimension price and, as discussed earlier, it too is increasing (see figure 2, page 9a).

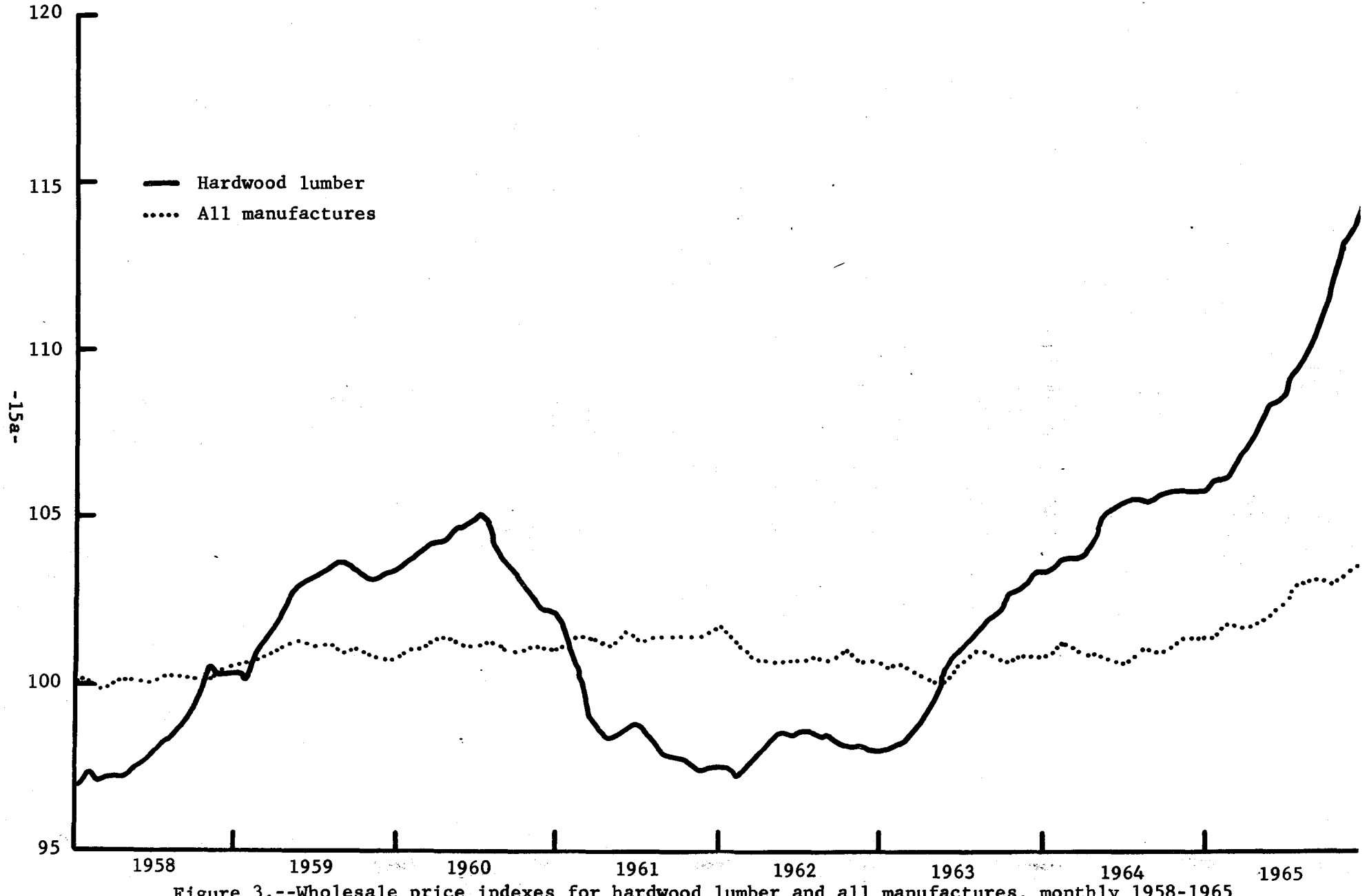


Figure 3.--Wholesale price indexes for hardwood lumber and all manufactures, monthly 1958-1965

Source: U.S. Dept. Labor (BLS) Wholesale Price Indexes, Hardwood Lumber, Code 08-14, and U.S. Dept. Com. (OBE) Survey of current business and biennial supplement, 1965.

It is reasonable to assume that the direction of hardwood dimension prices will be the same, although they may lag the lumber and labor indexes somewhat and increase at a slower rate if dimension producers attempt to gain production efficiencies rather than pass the increased raw material and labor costs to the customer. In a boom economy cost increases are likely to be passed on more quickly and if dimension prices are increasing more rapidly than the lumber and labor costs of dimension users, some furniture producers may decide to expand their rough-end mill capacities rather than buy dimension.

The index of unit value of dimension stock gives a rough indication of the trends in average prices and shows a substantial increase over the past 10 years. The index has been increasing faster than the average prices for all commodities:

Year	Index of unit value[1/] (1954 = 100)	All commodity wholesale price index[2/] (1954 = 100)
1954	100	100
1958	110	108
1963	120	108

1/ U.S. Dept. Comm. Census of Manufactures, 1963. Final Report MC63(2)-24A, logging camps, sawmills and planing mills. 1966.

2/ Derived from U.S. Dept. Comm. Statistical Abstract of the U.S., 1965.

To the extent that the proportion of higher value dimension in the total output is increasing, these indexes will be inflated, but the apparent change in product mix has been slight during this period (see table 4,

page 21). Price is a very important consideration for dimension users, therefore, every effort made by dimension producers to increase production efficiency, reduce unit costs and keep prices as stable as possible will be worthwhile from the standpoint of long run profit.

Promotion and Product Differentiation

In this study, promotion includes advertising and personal selling by individual firms and the Hardwood Dimension Manufacturers' Association (HDMA). Most of the firms in the industry rely on personal selling, either by their sales agents or executives, to promote their products. A few producers advertise in trade journals and stress the type and species of dimension available.

The HDMA does some promotion work consisting of occasional articles in trade journals and a membership list/sales brochure sent to prospective customers. One interesting aspect of the HDMA promotion program is that members sometimes refer business that they cannot handle to other HDMA member firms.[6/]

The basic problem for industrial advertisers is to show potential customers that the product advertised will reduce costs and increase efficiency and profits (20). The HDMA emphasizes this aspect of dimension stock but few advertisements of individual producers do. These advantages may be stressed in personal contacts with users, but trade magazine advertisements are an excellent means of reaching non-users and their use probably should be increased.

6/ Discussion with Mr. A. F. Jones, President, HDMA, November 9, 1965.

Product differentiation, that is, attempts by individual firms to make their product distinctive in some way, goes hand in hand with promotion. In the dimension industry most product differentiation is based on species or quality. There are few, if any, brand names used although some of the larger horizontally integrated companies lend prestige to their products through the company name and the HDMA differentiates the products of its member firms from the industry at large by using the HDMA certificate of quality.

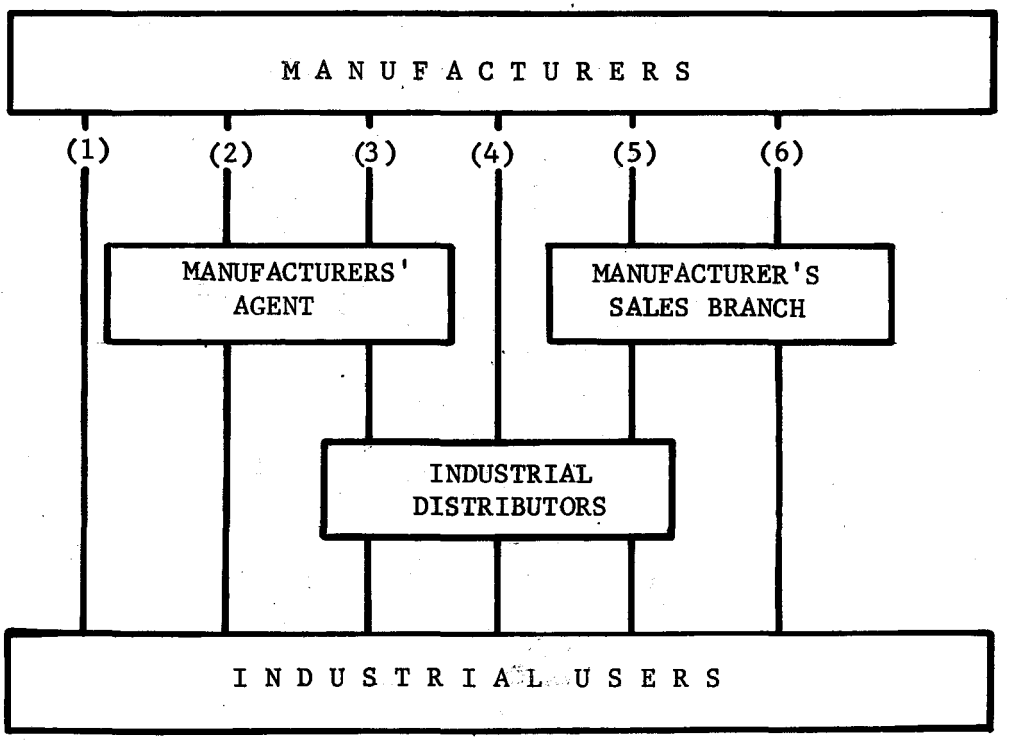
In general, product promotion and differentiation are fairly low key in the dimension industry. Whether the promotion programs in effect are adequate to stimulate primary demand for the product is an open question, but there are indications that more aggressive promotional programs are needed.

Channels of Distribution

As a manufacturer of industrial parts, the hardwood dimension producer has the choice of several alternative channels of distribution (figure 4). It appears that two channels are most often used: direct to user (figure 4, channel 1) and through manufacturers' agents[7/] to user (figure 4, channel 2). Both methods are used simultaneously by many of the firms.

7/ A manufacturers' agent is a firm, in business for itself, that sells part of the output for two or more clients but does not take title to it. Selling is generally done in a given territory and the agent has little to say regarding price or terms (30).

Figure 4.--Principal channels of distribution for industrial goods



Source: Diamond, William T. Distribution channels for industrial goods. Ohio State University, 1963.

Only the largest firms employ salesmen. Most of the direct sales to users are consumated by the sales manager working from his office. The buyer frequently takes the initiative in locating his supplier and seems to rely on trade journal listings, the HDMA, and advice of friends (40).

Manufacturers' agents are used to a large extent in markets that are located a substantial distance from the production area. This is a practice common to industrial goods manufacturers whose markets are distant enough to make direct selling too expensive (30).

Little has been done to describe or evaluate the channels of distribution used by dimension manufacturers and an evaluation of their efficiency here would be impractical due to the limited knowledge at hand. The present mix of direct selling and use of manufacturers' representatives is probably adequate, however, additional research to describe and analyze the present distribution channels may be beneficial to the industry.

THE MARKET

MARKET TRENDS

Prior to World War II the major markets for dimension stock were the vehicle and handle industries (24, 64). Of the $56 million worth of products classified in the "Wood Turned and Shaped and Other Wooden Goods" category of the 1931 Census of Manufacturers, $16 million (29 percent) was vehicle stock including body parts and $9 million (16 percent) was handle stock (64). The balance was made up of products for relatively minor markets such as textile machinery shapes, furniture turnings and shapes, ladders and parts, toy parts and novelties, woodenware, and scaffolding equipment. At present, metals have almost completely replaced wood in vehicles and the relative importance of the handle stock segment of the dimension industry has declined.

The furniture industry now constitutes the dominant market for hardwood dimension stock. In 1963, 68 percent of the value of hardwood dimension shipments--over $114 million--went to the furniture industry (table 4). Other markets, while important in total, are relatively minor when considered individually.

The hardwood dimension industry has shown constant long term growth since 1947 (table 5) and all segments of the industry have shown rapid growth since 1958 (table 6).

Table 4.--Composition of hardwood dimension industry shipments by type of dimension, 1958 and 1963

Type of dimension and product code	Percent of total value of shipments	
	1958	1963
Furniture dimension:		
Rough or surfaced (24262.21)	29.6	27.3
Semi-fabricated (24262.51)	6.1	13.5
Completely fabricated except frames (24262.81)	30.0	26.8
Total furniture dimension	65.7	67.6
Other dimension:		
Other industrial dimension except completely fabricated (24262.84)	17.6	18.5
Other completely fabricated industrial dimension (24262.89)	9.4	7.9
Hardwood dimension not specified by kind (24262.00)	7.3	6.0
Total other dimension	34.3	32.4
Total hardwood dimension (24262--)	100.0	100.0

Source: U.S. Dept. Com. Census of manufactures, 1963. Final report MC63(2)-24A, logging camps, sawmills and planing mills. 1966.

Table 5.--Value of shipments of hardwood dimension stock by selected years, 1947-1963

Year	Current dollar value of shipments	Constant dollar[1/] value of shipments
	(Thousand dollars)	(Thousand dollars)
1947	85,456	113,037
1954	91,086	100,315
1958	102,895	103,412
1959	121,216	119,660
1960	132,552	130,851
1961	132,996	131,940
1962	146,706	145,542
1963	169,806	168,626

[1/] Deflated by the wholesale price index for all commodities except farm and food goods for each year on a 1957-1959 = 100 base.

Source: U.S. Dept. Com. Census of manufactures, 1963. Final Report MC63(2)-24A, logging camps, sawmills and planing mills. 1966.

Table 6.--Growth in value of shipments of hardwood dimension by type of dimension, 1958-1963

Type of dimension and SIC code	Value of shipments (Thousand dollars) 1958	1963	Percent increase 1958-1963
Hardwood dimension (24262--), Total	$102,895	$169,804	65
Furniture dimension, Total	67,582	114,617	70
Rough or surfaced (24262.21)	30,503	46,277	52
Semi-fabricated (24262.51)	6,243	22,758	265
Completely fabricated except frames (24262.81)	30,836	45,582	48
Other dimension, Total	35,313	54,932	56
Other industrial dimension except completely fabricated (24262.84)	18,108	31,469	70
Other completely fabricated industrial dimension (24262.89)	9,674	13,463	39
Hardwood dimension, not specified by kind (24262.00)	7,531	10,257	36

Source: U.S. Dept. Com. Census of manufactures, 1963. Final report MC63(2)-24A, logging camps, sawmills and planing mills. 1966.

This growth may be the result of: (1) the overall growth of the using industries, (2) a restructuring of using industries away from in-plant manufacture to use of purchased dimension, (3) the increased use of solid wood (both lumber and dimension stock) per unit of furniture, or (4) a more rapid rate of growth for using firms than for the non-using firms. Available data are not sufficient to generalize on the nature of the dimension industry's growth, but it does appear that the dimension industry is growing about as fast as most of its major customers (table 7). The production indexes do not account for all facets of the growth pattern however. Research to determine reasons for the recent growth pattern in the dimension industry would be basic to projecting future trends and establishing courses of action for the industry.

TYPES OF DIMENSION PREFERRED

There appears to be a preference for less refined dimension stock if volume of lumber consumed by type is an indication of volume of production:

Type of dimension	Percent of lumber consumed in: Furniture dimension	All dimension
Rough and surfaced	53	73
Semi-fabricated	19	
Fully-fabricated	28	27

Source: Derived from U.S. Dept. Comm. Census of Manufactures, 1963, Final report MC63(2)-24A, logging camps, sawmills, and planing mills. 1966.

Table 7.--Production indices for hardwood dimension and selected wood furniture industries, 1958 and 1963

Industry and SIC	Production index		
	1954	1958	1963
Hardwood dimension (24262)	100	97	146
Wood household furniture, not upholstered (2511)	100	106	145
Wood household furniture, upholstered (2512)	100	138	144
Mattresses and bedsprings (2515)	100	107	114
Wood office furniture (2521)	100	109	146

Source: U.S. Dept. Com. Census of manufactures, 1963. Final reports MC63(2)-24A, logging camps, sawmills, and planing mills; MC63(2)-25A, household furniture; and MC63(2)-25B, office, public buildings, office and store fixtures, and miscellaneous furniture. 1966.

Many furniture companies using dimension stock as an adjunct to their own parts production do so because the rough-end mill and machine room are the manufacturing bottlenecks that limit assembly and finishing operations. Therefore, to make full use of their assembly and finishing capacity, they purchase more fully refined dimension to by-pass the bottlenecks. More rough, dry dimension would probably be used in furniture plants where the kiln is the bottleneck. If a furniture company relies only upon dimension stock as its raw material, it will benefit from fully machined stock that requires less investment in space and equipment and allows greater value of output per square foot of plant, per machine, or per man-hour.

The type of dimension stock required by other industrial users depends entirely upon their operations. If they are primarily concerned with manufacturing a product in which the wooden part plays a minor role, or if production facilities cannot handle the machining of wood, they will probably buy completely fabricated parts. However, if their production is geared to wood machining, for instance, the manufacture of ball bats or musical instruments, they will probably buy rough or semi-fabricated stock.

FACTORS AFFECTING USE

Hardwood dimension stock is an industrial good[8/] and the decision to purchase it is usually based on rational criteria such as product quality, product economy, and service provided. These criteria are therefore important in assessing the market for dimension stock.

Product Quality

Dimension quality can be divided into two general categories: performance and appearance. The requirements for either in dimension stock are dependent on end use and are usually established by each customer.

Quality is the most important criterion furniture manufacturers use in selecting dimension suppliers (table 8). Any deviation from specifications causes production delays and increases costs of furniture fabrication. Low quality dimension marketed in the past has turned many potential users against purchased dimension and has reinforced the practice of in-plant production. For this reason, the dimension industry must consistently meet rigid performance requirements and convince skeptical customers that they can do so.

8/ Stanton (60) recognizes five types of industrial goods: (1) raw materials, (2) fabricating materials and parts, (3) installations (capital goods), (4) accessory equipment, and (5) operating supplies. Dimension stock fits best in the second category which are goods that have already undergone some fabrication, may undergo further processing, and will become part of the final product.

Table 8.--Criteria used to select hardwood dimension suppliers

Criteria	Index of importance[1/]
Quality	148
Price	96
Service (e.g., meeting delivery dates)	91
Complete line of capabilities	36
Location	9
Other	6

1/ Calculated by assigning four points to a first place ranking by respondents, three points to a second place ranking, two for a third place, and one for a fourth place.

Source: Haas, Raymond. The manufacture of hardwood dimension in West Virginia--a feasibility study. W. Va. University, 1964.

Appearance is generally more a function of species and grade of lumber used than of the production operation, and is therefore more controllable and not as much a problem for dimension producers as performance quality. Furniture with exposed wood parts usually requires dimension stock free of knots, worm holes, and stain; for unexposed frames these requirements are generally not as important.

In general, the overall quality of dimension stock today is good. This has not always been true and has made some potential users skeptical.[9/] Because users attach such great importance to quality (table 8) dimension producers must constantly attempt to maintain and improve their own standards.

One method of doing this on an industry-wide basis is to establish minimum standards that all manufacturers can follow. The Hardwood Dimension Manufacturers' Association (HDMA) and the National Hardwood Lumber Association (NHLA) have attempted to do this through published grading rules (42, 49). The HDMA rules apply primarily to semi- or fully-fabricated kiln-dry dimension, whereas the NHLA rules apply to rough, green, or air-dried stock. However, because of the wide diversity in end use, the standards become less effective in application and the dimension producer is forced to conform to widely varying standards established for each customer. This diversity of performance requirements and lack of effective standardization causes difficulties for the dimension producers. If two or more orders have

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9/ Discussions with furniture and dimension manufacturers, September-December 1965.

different size and moisture content tolerances, they cannot be effectively combined and the dimension producer thereby loses possible economies of mass production. The diversity increases bookkeeping, administrative, and supervisory costs for each order, as well as set up time and possibility of machine operator error.

Product performance and appearance are important factors in setting the future course of the dimension industry. If dimension producers cannot meet the quality and performance standards of their customers, the customers will either continue to make their own dimension or begin to look for other materials such as aluminum, plastic, and steel to satisfy their need. Much of the diversity in requirements will be difficult to overcome, but with more cooperation between producers and users associations, it might be reduced. The whole problem of quality control needs closer scrutiny on an industry-wide basis.

Product Economy

As used here the term "product economy" means the cost of using purchased hardwood dimension stock when all factors are considered. It is probably the most important reason for the dimension industry's existence.

As early as 1932, it was recognized that hardwood dimension stock afforded the user advantages which generally derive from (23):

1. Reduced unit transportation cost of dimension parts versus lumber
2. Reduced requirements for woodworking machinery
3. Reduced material inventory
4. Reduced factory and storage space requirements
5. Reduced overhead costs
6. Lower labor costs
7. Better allocation of materials cost
8. Reduced waste disposal problems and costs
9. Reduced raw material degrade and loss.

Transportation costs per unit of useable material are reduced when dimension stock is shipped, since the user does not pay for the waste or water present in rough green lumber. If a dimension user buys fully machined parts, his operation becomes one of assembly and finishing which eliminates requirements for dry kilns, rough end mill equipment, and most of his machining equipment. By reducing his equipment needs a user can reduce the amount of factory space required or utilize it for assembly and finishing operations which add more value to the product. By purchasing precut, predried parts the volume of inventory required by the furniture manufacturer can be reduced. This would reduce storage space, allow a faster inventory turnover, increase working capital availability, reduce carrying charges, and lower the cost of handling unuseable material. By using purchased dimension parts a manufacturer can establish a definite raw material cost. Such a practice will do away with the

necessity of figuring waste factors and yields on lumber, which vary with species and grade and are costly and time consuming to establish. The dimension manufacturer is often able to more fully utilize his lumber input by combining orders of different cutting sizes and quality thereby obtaining better yield. Waste is handled by the dimension manufacturer rather than by the furniture manufacturer, who can use his higher cost labor and space for more profitable undertakings.

Although these areas of potential saving have been generally recognized for nearly 35 years, there are still a great many furniture companies that use no dimension stock whatsoever. And paradoxically Haas (41) found that cost in one form or another accounted for 41 percent of the reasons for non-use.

This indicates that these potential areas of saving are either non-existent in practical application or are not as widely recognized as generally suspected. There is an apparent need for value analysis studies of a practical nature upon which a dimension user might base a make-or-buy decision.

Service

A very important factor affecting the market for dimension stock is the amount and type of services given the customer. Table 8 indicated the relative importance that furniture manufacturers attach to various supplier

selection criteria. Service is ranked third in importance, only slightly lower than price.

Production scheduling is of critical importance to furniture producers and delivery of component parts must be made on time. In the past, poor delivery has caused some furniture firms to discontinue use of dimension stock. However, most dimension manufacturers in business today provide adequate delivery service. Common carrier trucks are used extensively for overnight service to relatively close markets. Longer hauls, such as to the West Coast, are generally made by rail.

Product development services, such as assistance given the customer in applying dimension stock to his product, are provided by a relatively small number of dimension firms. Most service of this type is given to small furniture firms[10/] that may have small or non-existent engineering and designing staffs of their own.

Product development service is probably more important to using industries other than the furniture industry because they are generally making products that are not as dependent on wooden parts and their engineering staffs may not be familiar with the applications, properties, and limitations of wood.

10/ Personal discussion with Mr. J. Edgar Kennedy, Managing Director, Hardwood Dimension Manufacturers' Association, Nashville, Tennessee. October 19, 1965.

Service, like quality and price, is an important selling point for hardwood dimension producers. Many producers are aware of this, but many more may be missing some lucrative customers by not knowing the kind and amount of service desired by the customer.

THE FURNITURE INDUSTRY AS A MARKET

Size of the Market

In 1963, there were 6,106 establishments classified in the wood household not upholstered, wood household upholstered, mattress and bedspring, and wood office furniture industries (74, 75). These industries are the major users or potential users of hardwood dimension. Haas (41) estimated that 45 percent of the wood furniture industry was using purchased hardwood dimension in 1963. This indicates that as many as 2,700 establishments may comprise the present market for all types of furniture dimension. But perhaps an even more interesting figure derived from this statement is that 55 percent or 3,300 establishments were not using purchased hardwood dimension. In addition, very few firms using dimension rely solely upon it for their lumber input. This indicates a very large potential market in the furniture industry.

Wood household furniture[11/] makes up the most important category in the furniture industry. It accounted for 63 percent of the employment, and

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11/ Includes SIC categories 2511 (wood household, not upholstered) SIC 2512 (wood household, upholstered), and SIC 2515 (mattresses and bedsprings).

58 percent of the value added by furniture manufacture in 1963 (74). This segment is also the major consumer of furniture dimension accounting for about 75 percent of the furniture dimension produced in 1963 (74).

Location

Although furniture firms can be found in almost every state in the Nation, there are several generally recognized concentrations on a regional basis. The Mid-Atlantic Region has the most establishments in the wood household furniture industry but the South Atlantic Region ranks first in the value of shipments (74). The South Atlantic and East North Central regions tend to have the larger firms, the Mid-Atlantic, and Pacific, the smaller firms.

The fastest growing region is the South Atlantic which increased its value of shipments nearly 50 percent between 1958 and 1963--an absolute increase of over $303 million. This was over three times as much as the next highest region (figure 5).

Considering only the above data, the South Atlantic Region appears to have the greatest potential as a market for hardwood dimension stock. What, then, is its present status as a market?

In his survey of the National Association of Furniture Manufacturers (NAFM), Haas (40) found that a greater percentage of furniture manufacturers in the East North Central Region purchase dimension stock than in other regions. The NAFM is only lightly represented in the South Atlantic Region

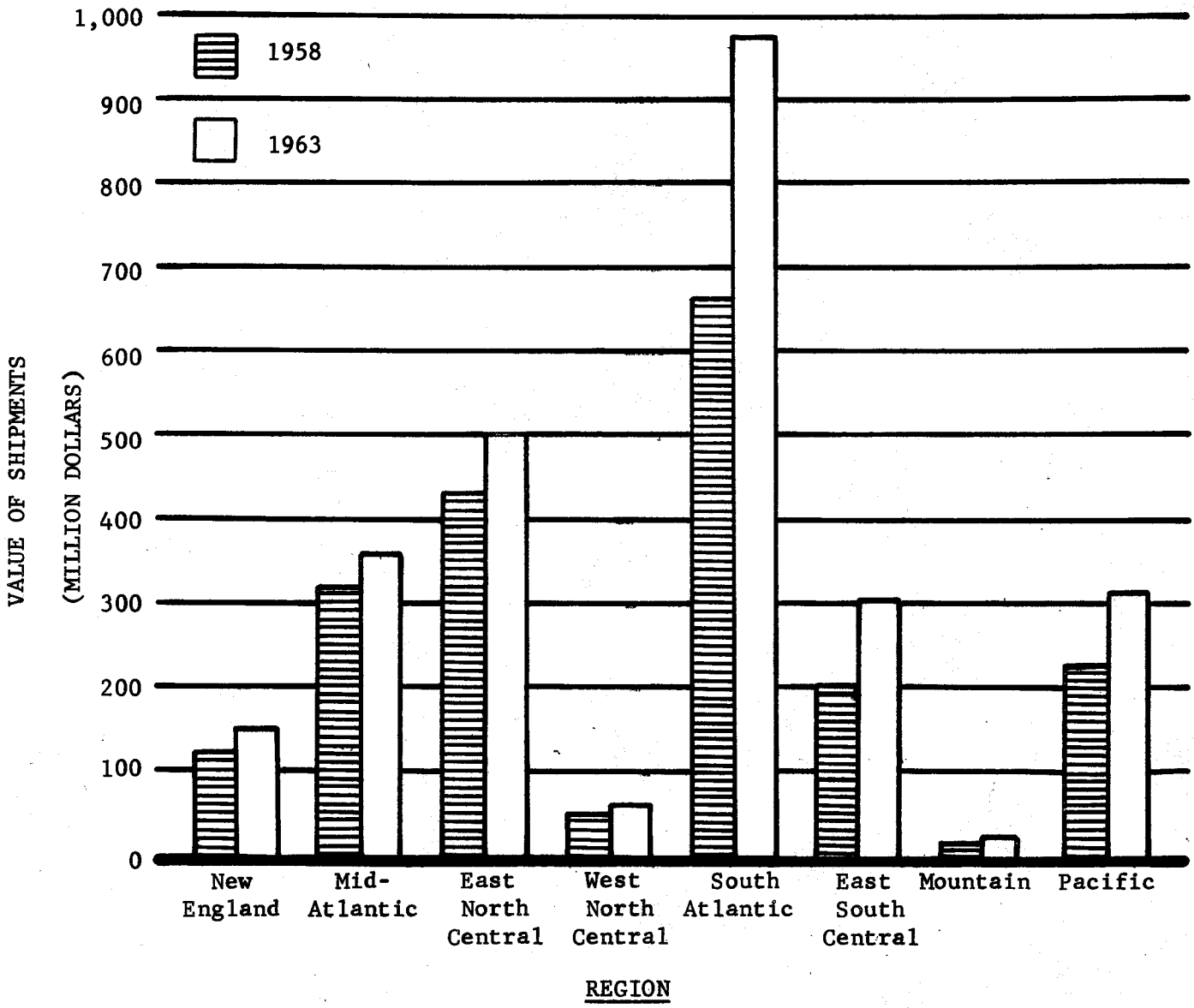

Figure 5.--Value of shipments, wood household furniture,[1/] by region, 1958 and 1963

[1/] Includes SIC categories 2511, wood household, not upholstered; and 2512, wood household, upholstered.

Source: U.S. Dept. Com. Census of manufactures, 1963. Final report MC63(2)-25A, household furniture. 1966.

and his results may not be valid for that region, but the indications seem to be that southern furniture manufacturers purchase relatively small amounts of dimension stock.[12/] As discussed earlier, this may be due to the low labor costs and proximity of lumber supplies, or to a feeling that suppliers are unreliable. The actual reasons are not known for certain and a survey of attitudes in this region would aid dimension producers in their market planning.

Outlook

Continued population growth, new housing, new family formations, disposable income growth and motel and hotel construction will all contribute to the expected growth of the furniture industry (72). The annual average increase in value of shipments for wood household furniture was about 6 percent between 1954 and 1964 (72) and is expected to continue at least as high in the next few years.

The motivation of consumers to buy furniture may be changing. In the past consumers looked at furniture as a lifetime purchase. The new consumer may be concerned more with change and refreshment; with enjoying and using rather than simply owning (6). But quality remains an important consideration and may become even more important as consumers become better informed. The new consumer is also interested in a certain amount of

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12/ From unpublished notes of discussions with dimension manufacturers and furniture manufacturers during November-December 1965 on file at the Forest Products Marketing Laboratory, Princeton, West Virginia.

individuality (31). This means that the furniture manufacturers will have to be flexible in their designs and be able to combine as few parts as possible in many different ways (61). It may mean that the furniture producer will be concerned with assembly and finishing, leaving the part production to other firms. At least one furniture manufacturer has predicted that the furniture industry of the future will be one of automated assembly plants relying on other sources for their raw material supply (11). To the extent that this prediction is valid, the dimension industry's future appears favorable.

Much of the hardwood dimension stock purchased today is a supplement to the furniture firm's rough-end mill output. As business expands the furniture firms must decide whether to: (1) rely on dimension producers to supplement their existing rough-end mill with increasing quantities of dimension stock, (2) rely solely on purchased dimension stock as their rough-end facilities become depreciated and obsolete, or (3) expand and update their rough-end facilities to meet increasing production rates while reducing their reliance on purchased dimension. The answer in large measure is up to the dimension producers. They must convince the furniture firm that they can deliver quality products on time and at less cost than the furniture firm can make these same products.

OTHER INDUSTRIES AS MARKETS FOR HARDWOOD DIMENSION STOCK

Gill (38) found that some form of dimension stock, either hardwood, softwood, or composite panel, was used in virtually all of the 21 major industry groupings of the U.S. Department of Commerce Standard Industrial Classification. Although Gill's classification of dimension stock is much broader than the one used here it does give some indication of the extent of precut wood part consumption and the potential markets for hardwood dimension.

Most of the markets for industrial stock are small when considered individually. They are generally characterized by a few buyers of small amounts that often become captive to a given dimension manufacturer.

Table 9 outlines some markets other than furniture and wood products that might use hardwood dimension. It appears that sporting goods and toys, musical instruments, hand tools and cutlery, general machinery and electrical equipment manufacturers have the most promise as dimension markets.

The toy and game industry has potential for hardwood dimension parts but any hardwood dimension manufacturer wishing to enter this market is faced with strong competition from other materials. Softwood cut stock and plywood are widely used in wooden toys and games, and competition from plastic and metal toys is very intense.

Table 9.--Potential industrial markets for hardwood dimension stock

SIC[1]	Product group	Dimension[2] used in 1960 (thous. dollars)	Hardwood dimension potential[3] (M.B.F.)	Trend in wood use[4]	Trend in industrial growth: Recent[5]	Trend in industrial growth: Long-term[6]
	CONSUMER GOODS					
3131	Footwear cut stock	2,815	3,723	declining	D.	S.
3161	Luggage	1,292	116	declining	S.	S.
3421	Cutlery	6,404	15,979	increasing	M.G.	H.G.
3423	Hand tools				H.G.	S.
373-	Ship and boat building	2,281	17,567	declining	S.-D.	M.G.-S.
3931	Musical instruments	4,135	20,214	level	V.H.G.	M.G.
3941	Toys and games	19,061	50,549	level	V.H.G.	V.H.G.
3949	Sporting goods			increasing	S.	H.G.
3981	Brooms and brushes	12,945	4,923	increasing	S.	S.
3988	Morticians goods	307	21,517	declining	S.	S.
	COMMERCIAL EQUIPMENT					
3585	Refrigeration equipment	198	6,273	increasing	D.	not available
3993	Signs and displays	5,743	2,979	declining	H.G.	H.G.

See footnotes at end of tables.

Table 9.--Potential industrial markets for hardwood dimension stock contd.

SIC[1]	Product group	Dimension[2] used in 1960 (thous. dollars)	Hardwood dimension potential[3] (M.B.F.)	Trend in wood use[4]	Trend in industrial growth: Recent[5]	Trend in industrial growth: Long-term[6]
	INDUSTRIAL MACHINERY AND EQUIPMENT					
3522	Agricultural implements	1,839	6,762	declining	S.	not available
355-	Special machinery	4,218	8,358	increasing	M.G.-H.G.	S.-M.G.
3565	Industrial patterns	53	155	declining	M.G.	not available
35--	General machinery[7]	2,584	43,354	increasing	M.G.	M.G.
36--	Electrical equipment	61,043	23,490	increasing	M.G.	M.G.
3713	Truck and bus bodies	1,638	18,603	declining	H.G.	S.
3715	Truck trailers				M.G.	H.G.

1/ U.S. Department of Commerce Standard Industrial Classification (SIC). Two digit numbers identify Major Industry Groups; three digit numbers, Industry Groups; and four digit numbers, Industries.

2/ Includes softwood cut-stock, hardwood dimension, and composite panels of lumber, veneer, plywood, hardboard or particle board. (Source: Gill, T. Wood used in manufacturing industries, 1960. U.S. Forest Service. 1965.)

3/ Calculated as 65 percent of hardwood lumber used in 1960 to allow for 35 percent waste in manufacture. This potential is in addition to the dimension stock used in 1960 (column 3). (Source: Derived from Gill, T. Op. Cit.)

4/ Increasing = Over 5 percent increase in total wood used between 1948 and 1960;
Level = ± 5 percent change in total wood used between 1948 and 1960;
Declining = More than 5 percent decline in total wood used between 1948 and 1960.
(Source: Derived from U.S. Forest Service. Timber Trends in the United States. 1965).

5/ V.H.G. = Very high growth: Average annual increase in employment between the 1958-1960 period and the 1961-62 period was 10 percent or better.
H.G. = High growth = 5 to 10 percent gain in average annual employment between 1958-1960 and 1961-1962.
M.G. = Moderate growth = 0 to 5 percent gain in average annual employment between 1958-1960 and 1961-1962.
S. = Static = Average annual employment declined but value of shipments rose between 1958-1960 and 1961-1962.
D. = Decline = Both average annual employment and value of shipments declined.
(Source: Area Redevelopment Admin. Growth and labor characteristics of manufacturing industries. 1964).

6/ V.H.G. = 1962/1947 ratio of value added exceeds 152 percent of the ratio for all manufacturing industries.
H.G. = 1962/1947 ratio of value added is 110 to 152 percent of ratio for all manufacturing.
M.G. = 1962/1947 ratio is 85 to 110 percent of ratio for all manufacturing.
S. = 1962/1947 ratio is 51 to 85 percent of ratio for all manufacturing.
D. = 1962/1947 ratio is less than 51 percent of ratio for all manufacturing.
(Source: Area Redevelopment Admin. Op. Cit.)

7/ Except SIC 355-, 3522, 3565, and 3585.

In the sporting and athletic goods industry, baseball and softball bats, hockey sticks, bobsleds, gymnasium and playground equipment, and bowling pins use hardwood parts.

Baseball and softball bats require large amounts of ash blanks, but here the dimension manufacturer is faced with only three or four buyers who control a major portion of the market. One bat manufacturer claims more than half of total industry output (4). Although these manufacturers buy large amounts of stock on the open market, they control several of their own dimension mills. The requirements for straight grained, tough ash billets may also limit a dimension producer's entry into this market.

Bowling is a sport which has been popular in recent years. This, of course, provides a good market for bowling pins and alleys which are generally made from either solid or laminated maple stock. Wooden pins are being kept competitive with pins of other materials by increasing their life with numerous layers of a plastic coating material (3). This market is also characterized by a few large buyers and recently has suffered from overbuilding.

The entire sporting goods industry promises to be one of growth. The value of shipments in this industry increased 20 percent between 1958 and 1963 to a level of nearly $700 million (71). As consumer income and leisure time increases and jobs tend to become more sedentary through labor saving devices, the needs and desires for more athletic activity and equipment will increase. Evidence of this has already begun to show in our economy and if wood remains a favored material, dimension stock producers may find a lucrative market.

Some dimension manufacturers may find a potential market in the musical instruments industry. One manufacturer of musical instruments uses 30,000 square feet of maple dimension per month in its products (13). Backs for electrical guitars are being made by several dimension producers from edge-glued dimension stock to meet a current strong demand for that instrument. This industry is also growing and wood is favored for its resonance and finishing characteristics.

Hand tools and cutlery use wood primarily for handles. Small dimension stock would be particularly suitable for such use. However, other materials such as steel, plastic, or plywood are being used and may reduce the dimension stock possibilities somewhat.

The machinery and electrical equipment industries use substantial amounts of wood but a large part of it is used as dunnage, bracing, pallets, and containers. The possibilities of using dimension stock in these industries are not known for certain. However, some machinery, such as farm implements, refrigeration equipment, and industrial patterns may provide uses for dimension stock.

Wood products industries, such as millwork and pallet industries, may be possible markets for dimension stock. The millwork industry manufactures windows, doors, moldings, interior trim, and stair treads and risers. In 1963, the millwork industry shipped over $1 billion worth of products (68). This includes shipments from establishments where millwork is a secondary

product including many hardwood dimension manufacturers. For example, 27 of the 33 HDMA members list moldings as one of their products.[13/]

This raises the question of whether the millwork industry is a market for hardwood dimension stock or whether dimension producers are part of the millwork industry with the construction industry as the market. Although some rough dimension stock is probably purchased by the millwork industry, it appears that the latter case is more prevalent especially for items such as moldings, trim and stair treads and risers that need no assembly prior to installation. In either case, the market will fluctuate with the fluctuations in construction.

Some mention has been made of a possible market for precut pallet parts.[14/] The idea is to provide pallet users with precut parts to be assembled as needed. This introduces the possibility of a dimension plant cutting pallet parts and selling them directly to the user.

13/ From an HDMA sales brochure and membership list.

14/ Lucas, John T. A problem analysis of the wood pallet industry. 67 pp., illus. 1965 (Unpublished manuscript on file at the Northeastern Forest Experiment Station, Forest Products Marketing Laboratory, Princeton, West Virginia).

The pallet industry itself may, under certain conditions, become a market for precut parts. Pallet users tend to order sporadically in fairly large quantities.[15/] Since the pallet producer does not normally stockpile pallets, heavy demands for pallets are often not met. If the bottleneck is obtaining the needed quantity of lumber a pallet producer may consider ordering precut parts for assembly at his plant as a supplement to his own production. However, dimension producers would be reluctant to accept the infrequent and short notice orders that would result.

In all, several hundred products can and are using hardwood dimension stock. However, at the present time little seems to be known about markets for industrial dimension except that they exist and some producers are supplying them. It may be difficult for small dimension manufacturers to find other industrial markets but they should consider such a move. Diversification of markets can be of major importance when the traditional market suffers a set back. Further research on potential markets in industries other than furniture may be of help along these lines.

15/ Lucas, Op. Cit.

COMPETITION

Competition, in the everyday business use of the word, can be divided into two broad categories: (1) intra-industry competition, that is, rivalry among firms in the dimension industry; and (2) inter-industry competition--rivalry between dimension firms and firms producing other products which compete in the same market.

Intra-Industry Competition

To evaluate the extent of rivalry among firms in the industry, it is helpful to examine some of the characteristics of the competitive structure of the industry. The "ideal" generally used for this purpose is pure competition which is characterized by: (1) many sellers and buyers each of equal importance, (2) identical products produced by all sellers, (3) both buyers and sellers acting rationally with perfect knowledge of the market, and (4) buyers and sellers who are able to enter or leave the market at will. In a purely competitive market, a seller may either sell at the market price or not at all; a buyer may buy at the market price or not at all. Pure competition does not exist in our economy, but many industries including the dimension industry may approach it more closely than others.

The number of buyers and sellers in the dimension market is large and none purchase or sell enough to affect market price. This is a departure from the average industrial market which is usually characterized by a few large buyers and/or a few large sellers (20). The dimension product offered for sale frequently is differentiated by quality and species. As in most industrial

markets, buyers and sellers of dimension act rationally and their market knowledge is usually quite extensive although not perfect. Dimension buyers and sellers can move in or out of the market with more ease than those in the average industrial market. There is not perfect mobility, but restrictions on production factor requirements are low enough and substitute products available enough that mobility is facilitated.

These characteristics tend to increase rivalry among firms and decrease the chance of any one firm or small group of firms obtaining a sizeable share of the market. This also tends to keep long-term profit rates down and reduces the possibility of any firm gaining a technological advantage for any length of time. Given its present competitive structure, the future growth of the dimension industry is likely to be characterized more by new firms entering the industry than through any large growth in existing firms. Such a situation tends to limit the possibility of firm sponsored research and increases the necessity of publicly sponsored research.

Inter-Industry Competition

Inter-industry competition can generally be divided into three categories: (1) direct competition using the same raw materials; (2) direct competition using different raw materials; and (3) indirect competition resulting from forces which decrease demand other than those generated by direct competition.

For the purpose of this problem analysis, direct competitors using the same raw material will be those who use wood in some form. Included in this

category are the softwood cut-stock producers, plywood specialty product producers, chip-core or flake-board producers, and those firms that cut their own dimension stock from lumber.

The largest competitor of dimension stock is the furniture manufacturer's own rough mill. The furniture firms that do not use any purchased dimension must have their own rough-end mills and only a very few of the firms that do purchase dimension rely solely upon outside dimension producers. In 1963, the wood household furniture industry (including non-upholstered and upholstered) alone consumed 1,503,350,000 board feet of hardwood lumber in addition to purchased hardwood dimension (74). Although hardwood dimension is an important input to the furniture industry, its importance could be greatly increased.

There are several reasons for the continued use of rough-end mills by the furniture manufacturers. Haas (41) found the reasons for not using hardwood dimension were:

Reason	Percent of non-users
Cost too high	19
Quantities of furniture produced too small to use	22
Delivery problems	7
Have not been solicited	1

Cost and the need for flexibility appear to be the main objections to the use of purchased hardwood dimension. Those who said that the quantities of furniture produced are too small to use dimension are probably concerned

with the higher cost of small shipments of dimension and the reduced flexibility incurred when relying on outside suppliers and facing more numerous set up changes.

When asked what dimension producers could do to increase their business, non-users gave the following answers (41):

Methods	Percent of non-users
Lower prices	12
Improve quality	9
Better understanding of buyers' needs through close cooperation	5
Better delivery	6
Solicit our business	10
No answer	70

The most outstanding feature is that 70 percent of the non-users either could not think of anything the dimension industry could do to obtain more business, or weren't interested enough to reply. This coupled with the 10 percent who wanted to be solicited indicates a need for an expanded effort on the part of dimension producers to effectively market a quality product.

Softwood cut-stock is the softwood counterpart of hardwood dimension stock. The major portion of cut-stock goes to industrial uses other than furniture, but the amount used in furniture is significant. Furniture stock made up 18 percent of the value of shipments in 1963 (table 10), and over 109 million board feet of softwood furniture stock was shipped to users that year (73).

Table 10.--Value of shipment of softwood cut-stock by type, 1958 and 1963

SIC code	Product	Value of shipments			
		1958		1963	
		Thousand dollars	Percent	Thousand dollars	Percent
24217.--	Softwood cut-stock, TOTAL	56,334	100	87,917	100
24217.11	Furniture cut-stock	12,139	21	16,151	18
24217.51	Other industrial cut-stock	32,834	62	67,703	77
24217.00	Cut-stock, not specified by kind	9,361	17	4,063	5

Source: U.S. Department of Commerce. Census of manufactures, 1963. Final report MC63(2)-24A, logging camps, sawmills, and planing mills. 1966.

Some cut-stock goes into the knocked-down furniture pieces that many mail-order and discount houses sell. Often customers for this type of furniture are budget-minded making cost an important factor. Softwood cut-stock is also used in fully assembled household furniture, especially in the Early American style where the softwood, primarily pine, lends some authenticity to the style. Juvenile and other painted furniture provide additional markets for cut-stock.

More softwood is sold for furniture in the West than in the East. Los Angeles furniture manufacturers purchased 48 percent of their lumber input as softwood compared to a national average of about 16 percent (37). The geographical pattern of softwood cut-stock consumption is probably the same.

Cut-stock competes more with dimension stock in other industrial markets such as the toy and game, millwork, broom and brush, and cutlery industries. Almost $68 million of cut-stock was shipped to the "Other industrial" market in 1963 compared to only $45 million of hardwood dimension (73). Cut-stock can compete favorably in markets where strength is less important than other properties including price.

Board products such as plywood and particle board are beginning to compete effectively with hardwood dimension in some markets. Hardwood plywood has made serious inroads in the drawer side and back market. Several dimension manufacturers are cutting oak residue into drawer parts, but increasing numbers of furniture manufacturers are using hardwood plywood for this item. One

dimension manufacturer has indicated that plywood drawer sides are being imported from foreign sources at very competitive prices.16/

Molded plywood is being used for some chair backs, arms, and seats (28). One firm in England is making case goods completely from molded plywood parts (16) and a firm in the United States is making molded plywood frames for upholstered goods (27). Plywood specialty items, that is, parts cut to size and shape from plywood can also replace dimension parts in some markets--the toy and game industry, for example.

Chip-core, particle board, and flake-board have made serious inroads in a previously lucrative market for some furniture stock. Until a few years ago, yellow poplar pieces were edge glued to form veneer cores for table tops, desk tops and sides, and virtually any flat surface. Although chip-core has not eliminated this market, it has greatly reduced it.

Competition from materials other than wood has not been much of a factor in markets for furniture dimension so far, but may be in the future. A great deal depends upon what the final consumer wants and will accept in his furniture. There are new products such as plastic or metal drawer guides, molded plastic drawers, plastic corner blocks, and steel or plastic legs on the market now. At the present time, the consumer seems to prefer wood furniture, but this preference can change. Designers and manufacturers on the West Coast think that wood will continue to be a prestige material in

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16/ Personal correspondence from Mr. D. A. White, Vi-Den Products, Weston, West Virginia. December 8, 1965.

household, office, and commercial furniture, but more non-wood material will be found in the institutional and school furniture (37). They also feel that more plastic and metal hardware will be used to reduce costs and increase functional utility.

Plastic and metal have made more inroads in the other industrial markets for dimension than they have in the furniture market. Markets such as the toy and game industry and cutlery and tool industry, are especially susceptible to inroads by other materials.

Indirect competition can result from a shift in consumer purchases of the final products which use dimension, from a shift in the industrial user's product mix, or a change in the manufacturing process resulting in less use of wood. It can also occur if there is a change in the location of using industries that affects transportation costs. Although indirect competition of this sort is difficult to assess, dimension producers should remain abreast of the markets for final products in order to recognize any shifts that may affect long term demand.

STATUS OF THE INDUSTRY

RECENT DEVELOPMENTS

Application of the computer to woodworking has taken recent strides forward. At least one manufacturer of industrial parts is using computer programs to control labor distribution; process payrolls, accounts receivable and payable; and control inventory (12).

The computer is now being used to predict total potential yield of dimension stock from standard grades, sizes, and species of hardwood lumber. Such a program has been published by North Carolina State University (63), and a more comprehensive program is being established by the Forest Products Laboratory at Madison, Wisconsin. The ultimate goal of such programs is to tell what size and grade of lumber will provide maximum yield of given cutting sizes at least cost. It is then only a short step to a fully computerized cut-off and rip operation. One machinery manufacturer is planning to produce a lumber scanner in the immediate future that will detect flaws, knots, color variations, and splits and thereby assess the quality of a given piece of lumber and provide impulses to trigger other automatic machinery for cutting and sorting the stock (15).

A tape controlled router is also in use and foreshadows the application of numerically controlled machinery to woodworking processes (19).

A new patented process of sawing round blanks has been developed that will produce turning blanks up to 3 inches in diameter rapidly and inexpensively. It eliminates the waste associated with turning square pieces and facilitates drying (9).

Kiln drying rough dimension rather than lumber has been tried on occasion, but is not a widely accepted practice. Rice (56) has done some work in this area and found that costs of kiln drying rough dimension are lower than for rough lumber with the usable part yield remaining the same. Such a practice shows promise and it is more logical to dry higher value items in limited space as long as the practice does not decrease value.

Wood and plastic have been combined into an alloy through gamma radiation (45). This new alloy currently known as Wood-Plastic Composite (W.P.C.) increases the strength and dimensional stability of the wood and may eliminate the need for finishing processes through complete penetration of a colored plastic. Present drawbacks are the high cost of the process and greatly increased weight of the wood. However, W.P.C. may have application in such products as bowling pins, golf heads, tool handles, and the like.

In the face of rising labor and raw material costs dimension producers should be aware of and take advantage of any advances in production technology which can improve their efficiency and lower costs. Since this industry is especially susceptible to competition from other materials in many of its markets and is facing rising costs, production efficiency will take on increasing importance in years ahead.

SUMMARY OF PRESENT COMPETITIVE POSITION AND OUTLOOK

At the present time, the dimension industry is in a favorable position in terms of growth potential. The dimension production index has grown 46 percent between 1954 and 1963 (73). Production of wood furniture has grown about 45 percent between 1954 and 1963 (74, 75). One estimate is that as many as 45 percent of the wood furniture manufacturers are using purchased hardwood dimension which means the present market may contain 2,700 firms (40). However, from the other side of the coin, this would mean that 55 percent--some 3,300 firms--are not using hardwood dimension.

The major competition for dimension stock in the furniture market is from another wood product--lumber. With very few exceptions, the thinking of furniture manufacturers is still lumber-oriented. Most dimension stock is used as a supplement to the rough-end mill, or as small volume specialty items. Therefore, dimension stock is primarily a supplement to, not a replacement for, lumber in the furniture industry. In 1963, the wood household furniture industry consumed 1,503,350,000 board feet of hardwood lumber in addition to purchased dimension stock (74). If we assume waste in manufacture is 35 percent, this represents a lost market of over 977 million board feet of hardwood dimension that year. But it also indicates the size of the potentia

Whether or not hardwood dimension can capture even a part of this market depends on:

1. Its cost advantage in use over that of rough-end mill production;

2. The extent and type of service dimension producers can and will provide especially in the form of prompt delivery and cooperation on product engineering;

3. The extent to which the dimension producers can manufacture a product that meets the quality standards and specifications required by the furniture manufacturers;

4. The extent to which the dimension industry aggressively sells and efficiently markets its products.

The use of non-wood materials to replace dimension stock in furniture is not considered a major threat at the present time, because wood is considered desirable by the consumer. However, consumer desires may change and every dimension manufacturer who is alert will be watching the trends in consumer tastes for furniture materials.

In other industrial markets the tradition to use wood is not as strong. More emphasis is put on the functional aspect of materials and if metal or plastic will perform better, they may replace wood parts. Aggressive marketing on the part of dimension manufacturers can help to maintain present markets and develop new markets.

In all cases, the manufacturer who actively seeks to sell a quality product will be much better off than the one who rests upon past growth. A

final admonition is best summed up by a quote from an Area Redevelopment Administration publication (21): "...the (industry) cannot function properly by selling wood per se: rather it must sell the tangible results of applied labor, management, technical knowledge, and capital investment in the form of products responsive to market demand."

SUGGESTED RESEARCH

What has been determined from this discussion of the hardwood dimension industry? First of all, there are several areas of inadequate knowledge:

1. If the use of purchased dimension is a more economical way of producing final wood products, why are furniture manufacturers still producing so much of their own plants?

Several possible reasons have been discussed in this analysis, but they may not be true for all size classes of firms or all areas of the country. A broad survey of furniture firms, especially in the South, to determine the reasons for in-plant dimension production would provide insight to the strengths and weaknesses of the dimension industry.

The answers derived from such a study should then be further analyzed to determine possible corrective actions. For example: (a) If cost is a major factor, what is the actual cost of purchase versus production? Where can cost and efficiency improvements be made? How would restructuring of the industry affect costs? (b) If quality is a problem, how can quality be improved? What quality control measures are being used and how efficient

are they? Can user specifications be more standardized to ease production difficulties? (c) If service is a factor, what kinds of service are needed? How would they influence the cost picture? Can dimension producers in fact provide the kind of service desired? Is the problem of delivery service one that might be solved by another channel of distribution? (d) If lack of user knowledge is a concern, what influence do present marketing practices have on user knowledge? How can these practices be changed to better inform customers?

2. A second area of inadequate knowledge is the other industrial markets for dimension stock. What are they? Where are they? Why do they use dimension? Are there untapped markets in other industries? A study of other industrial markets may help pinpoint industries that dimension producers could supply in a move to diversify their markets.

3. A third area relates to the first two: What is influencing the trend in dimension industry growth and what is the potential for further growth? Answers to questions in this area can probably be derived from the studies in the first two areas.

Research designed to increase the dimension manufacturers' knowledge of their market structure, customer desires, quality improvements needed, improved selling methods, new production techniques, and decision making criteria will increase the efficiency of the industry, lower long-run costs, and increase benefits to users. Ideally the firms in the industry would carry on their own programs. A few can and undoubtedly are, but they are in the minority.

The amount of research done by and for the industry has been limited. Most firms are small and the industry structure is such that the research costs incurred by individual firms would not produce adequate benefits. There is, therefore, a need for publically supported research on an industry-wide basis.

The Forest Products Marketing Laboratory, Princeton, West Virginia, has the staff and resources available to carry out the program suggested here. The program is listed in a priority sequence based on the conditions existing in the industry today:

1. A determination of the market potential for hardwood dimension stock in the southern furniture industry.--This study would determine the present volume of dimension stock used, trends in lumber and dimension use, potential for increased use, type of dimension stock desired, reasons for use or non-use, and methods necessary to capture more of the market. The information gathered might provide reasons for the past growth trend of the dimension industry, indicate what the future trend might be, and help the dimension producer pinpoint the strengths and weaknesses of his marketing effort.

2. A determination of the market potential for hardwood dimension stock in other industrial uses.--A series of studies of individual industries to determine the potential for hardwood dimension use will be of value to the dimension producer seeking to develop a better product mix. These studies

would seek to measure the potential for increased use of dimension and would provide basic knowledge of industry structure, competition and performance which dimension producers could use to expand their markets.

3. Determination and evaluation of quality control standards and practices at dimension plants.--An exploration of the various quality control methods used in the dimension industry may provide the individual dimension producer with a guide to check his own operation and may provide indications of how industry-wide methods might be improved. Quality requirements of users could be determined, minimum quality levels established and least cost methods for obtaining at least minimum quality established.

4. Value analysis of purchased hardwood dimension versus rough-mill production.--There is a lack of clear understanding among furniture manufacturers whether purchased dimension is more costly than their own rough-end mill output. While it is recognized that there will be differences in cost from plant to plant, there is a lack of practical data upon which cost comparisons can be based. A series of value analysis case studies to develop information on cost of using purchased dimension versus in-plant production would benefit the dimension producer by providing comparative norms for judging his production and marketing efforts and would benefit the furniture manufacturer by providing a guide for the make-or-buy decision. These studies would determine cost of use in a new furniture plant where the decision on whether to install a rough-end or purchase dimension is to be made, and in

an established plant with a rough-end where the decision is to scrap the rough-end or not. Also the intermediate case of using both lumber and dimension would be considered.

5. An evaluation of the sales and marketing practices of the hardwood dimension industry.--This would be a broad study to determine current advertising methods used, services provided, sales techniques used, price and product policies and distribution channels used by dimension manufacturers and an evaluation of them in relation to user needs. Methods for improving these areas of marketing effort would be suggested.

6. An analysis of the alternative investments, costs, and returns associated with the production of various types of dimension stock.--By the development of case studies, guidelines can be established to aid in a decision for investment in hardwood dimension production or expansion of existing capacity based on costs and returns associated with rough, semi-fabricated and fully machined dimension stock. An analysis of the production of dimension by forward integration of the sawmill would be included.

7. A determination of methods for improving production techniques of dimension manufacturers.--In order to remain competitive with other materials in many of its markets, the dimension industry must increase its production efficiency. A study to determine the optimum use of production line techniques and substitution of capital for labor would help to keep dimension stock competitive with metal, plastic, molded board products, and other competing materials.

8. Methods of converting low grade logs to dimension stock.--With the increasing abundance of low grade hardwood logs and corresponding decrease in high grade logs, dimension producers may be faced with rising production costs in the future. The development of an economical technique for converting low grade logs or bolts to dimension stock would help to keep mounting production costs down and provide an outlet for more log grade hardwoods.

9. The effect of increased furniture parts standardization on the dimension industry.--This study would assess the possibilities of greater standardization of furniture parts and what effect, if any, it would have on the production, cost and marketability of hardwood dimension stock.

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